Type 3571 Pneumatic Actuator

Actuator areas: 27 in² · 54 in² · 116 in²

Mounting and Operating Instructions

EB 8820 EN

Edition April 2016
Note on these mounting and operating instructions

These mounting and operating instructions assist you in mounting and operating the device safely. The instructions are binding for handling SAMSON devices.

⇒ For the safe and proper use of these instructions, read them carefully and keep them for later reference.

⇒ If you have any questions about these instructions, contact SAMSON’s After-sales Service Department (samson@samsongroupna.com).

Referenced documentation

The following documents apply in addition to these mounting and operating instructions:

− Mounting and operating instructions for mounted valve, e.g. ▶ EB 8823 for Type 3525 Globe Valve

− Mounting and operating instructions for mounted valve accessories (positioner, solenoid valve etc.)

− ▶ AB 0100 for tools and lubricants

The mounting and operating instructions for all supplied devices are included in the delivery. The latest versions of the documents are available on our website at ▶ www.samsoncontrols.com.

Definition of signal words

⚠️ DANGER

Hazardous situations which, if not avoided, will result in death or serious injury

⚠️ WARNING

Hazardous situations which, if not avoided, could result in death or serious injury

⚠️ NOTICE

Property damage or malfunction

⚠️ Note

Additional information

💡 Tip

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1 Safety instructions and safety measures

Intended use
The SAMSON Type 3571 Actuator is designed for operating a mounted Type 3525 valve. In combination with the valve, the actuator is used to shut off the flow of liquids, gases or vapors in the pipeline. Depending on the version, the actuator is suitable for throttling or on/off service. The actuator can be used in processing and industrial plants.

The actuator is designed to operate under exactly defined conditions (e.g. thrust, travel). Therefore, operators must ensure that the actuator is only used in applications that meet the specifications used for sizing the actuator at the ordering stage. In case operators intend to use the actuator in other applications or conditions than specified, SAMSON must be contacted.

SAMSON does not assume any liability for damage resulting from the failure to use the valve for its intended purpose or for damage caused by external forces or any other external factors.

⇒ Refer to the technical data and nameplate for limits and fields of application as well as possible uses.

Reasonably foreseeable misuse
The actuator is not suitable for the following applications:
- Use outside the limits defined during sizing and in the technical data
- Use outside the limits defined by the accessories mounted on the actuator

Furthermore, the following activities do not comply with the intended use:
- Use of non-original spare parts
- Performing service and repair work not described in these instructions

Qualifications of operating personnel
The actuator must be mounted, started up, serviced and repaired by fully trained and qualified personnel only; the accepted industry codes and practices are to be observed. According to these mounting and operating instructions, trained personnel refers to individuals who are able to judge the work they are assigned to and recognize possible hazards due to their specialized training, their knowledge and experience as well as their knowledge of the applicable standards.
Safety instructions and safety measures

**Personal protective equipment**
We recommend wearing the following personal protective equipment when handling the Type 3571 Pneumatic Actuator:
- Protective gloves when mounting or removing the actuator

**Note**
More information on the safe handling of the diaphragms installed in the pneumatic actuators is available in [http://www.samson.de/reach-en.html](http://www.samson.de/reach-en.html).

⇒ Check with the plant operator for details on further protective equipment.

**Revisions and other modifications**
Revisions, conversions or other modifications to the product are not authorized by SAMSON. They are performed at the user's own risk and may lead to safety hazards, for example. Furthermore, the control valve may no longer meet the requirements for its intended use.

**Safety devices**
The Type 3571 Actuator does not have any special safety equipment.

**Warning against residual hazards**
To avoid personal injury or property damage, plant operators and operating personnel must prevent hazards that could be caused in the actuator by the process medium, the operating pressure, the signal pressure or by moving parts by taking appropriate precautions. They must observe all hazard statements, warning and caution notes in these mounting and operating instructions, especially for installation, start-up and maintenance.

**Responsibilities of the operator**
The operator is responsible for proper operation and compliance with the safety regulations. Operators are obliged to provide these mounting and operating instructions to the operating personnel and to instruct them in proper operation. Furthermore, operators must ensure that operating personnel or third persons are not exposed to any danger.

**Responsibilities of operating personnel**
Operating personnel must read and understand these mounting and operating instructions as well as the specified hazard statements, warning and caution notes. Furthermore, the operating personnel must be familiar with the applicable health, safety and accident prevention regulations and comply with them.
Safety instructions and safety measures

Referenced standards and regulations
According to the ignition risk assessment performed in accordance with EN 13463-1:2009, section 5.2, the non-electrical actuators do not have their own potential ignition source even in the rare incident of an operating fault. As a result, they do not fall within the scope of Directive 94/9/EC.

⇒ For connection to the equipotential bonding system, observe the requirements specified in section 6.4 of EN 60079-14, VDE 0165 Part 1.

1.1 Notes on possible severe personal injury

⚠️ DANGER

Risk of bursting in the actuator.
Actuators are pressurized. Improper opening can lead to actuator components bursting.
⇒ Before starting any work on the actuator, depressurize all plant sections concerned and the actuator.

1.2 Notes on possible personal injury

⚠️ WARNING

Crush hazard arising from moving parts.
The actuator contains moving parts (actuator stem), which can injure hands or fingers if inserted into the actuator.
⇒ Do not insert hands or finger into the yoke while the valve is in operation.
⇒ While working on the actuator, disconnect and lock the pneumatic air supply as well as the control signal.
Safety instructions and safety measures

**WARNING**

Risk of personal injury when actuator vents.
While the valve is operating, the actuator may vent during closed-loop control or when the valve opens or closes.

- Install the control valve in such a way that the actuator does not vent at eye level.
- Use suitable silencers and vent plugs.
- Wear eye protection when working in close proximity to the control valve.

Risk of personal injury due to preloaded springs.
Actuators with preloaded springs are under tension. They can be identified by the long bolts protruding from the bottom of the actuator.

- Before starting any work on the actuator, relieve the compression from the preloaded springs (see section 9.2).

1.3 Notes on possible property damage

**NOTICE**

Risk of damage to the actuator due to incorrectly attached lifting equipment.
The welded-on lifting eyelet, eyebolt or swivel lifting hook on the top diaphragm case is intended for mounting and removing the actuator as well as lifting the actuator without valve.

- Do not lift the entire control valve assembly using the lifting eyelet, eyebolt or swivel lifting hook.
- Do not attach load-bearing lifting equipment to the handwheel or travel stop.

Risk of actuator damage due to excessively high or low tightening torques.
Observe the specified torques on tightening actuator components. Excessively tightened torques lead to parts wearing out quicker. Parts that are not tightened far enough may loosen.

- Observe the specified tightening torques (AB 0100).
⚠️ **NOTICE**

Risk of actuator damage due to the use of unsuitable tools.
Certain tools are required to work on the actuator.
⇒ Only use tools approved by SAMSON (▶ AB 0100).

Risk of actuator damage due to the use of unsuitable lubricants.
The lubricants to be used depend on the actuator material. Unsuitable lubricants may corrode and damage the valve surface.
⇒ Only use lubricants approved by SAMSON (see parts list and ▶ AB 0100).
Markings on the Actuator

2  Markings on the Actuator

2.1  Actuator nameplate

The nameplate is stuck on the diaphragm casing. It includes all details required to identify the actuator:
- Manufacturer and type number
- Configuration ID as bar code and plain text
- Serial no.
- Country of origin
- Actuator area in in²
- Diaphragm material: NBR, EPDM or PVMQ (PVMQ not for 54 in²)
- Symbol indicating fail-safe action: stem extends or retracts:

<table>
<thead>
<tr>
<th>Actuator stem extends</th>
<th>Actuator stem retracts</th>
</tr>
</thead>
</table>
- Bench range in bar and psi
- Operating travel in inch and mm
- Bench range with preloaded springs
- Thread for pneumatic connection in G, NPT or Rc
- Permissible supply pressure $p_{\text{max}}$

3  Design and principle of operation

The Type 3571 Pneumatic Actuators with 27 in², 54 in² and 116 in² actuator areas contain a rolling diaphragm (A4) and internal springs (A10). They are mounted on SAMSON Type 3525 Valves.

The signal pressure $p_{\text{st}}$ creates the force $F = p_{\text{st}} \cdot A$ at the diaphragm surface $A$ which is opposed by the springs (A10) in the actuator. The bench range is determined by the number of springs used and their compression, taking into account the rated travel. The travel is proportional to the signal pressure $p_{\text{st}}$. The direction of action of the actuator stem (A7) depends on how the springs are installed in the actuator.

The stem connector clamp (A28) connects the actuator stem (A7) with the plug stem of the valve.

![Fig. 1: Example for nameplate](image-url)
Markings on the Actuator

A1 Top diaphragm case
A2 Bottom diaphragm case
A4 Diaphragm
A7 Actuator stem
A8 Ring nut
A10 Springs
A16 Vent plug
A28 Stem connector clamp
S Signal pressure connection

Fig. 2: Functional diagram of Type 3571 Pneumatic actuator with 27 in² actuator area
Design and principle of operation

3.1 Direction of action
The direction of action is determined by how the springs and diaphragm plate are arranged in the actuator.

With direction of action “actuator stem extends”, the compressed air is applied to the loading pressure connection on the bottom diaphragm case.

With direction of action "actuator stem retracts", the compressed air is applied to the loading pressure connection on the top diaphragm case.

The actuator’s direction of action can be reversed (see section 6.3).

3.2 Signal pressure routing
In the "actuator stem extends" version, the signal pressure is routed through the bottom loading pressure connection (S) to the bottom diaphragm chamber and moves the actuator stem (A7) upward opposing the spring force.

In the "actuator stem retracts" version, the signal pressure is routed through the top loading pressure connection (S) to the top diaphragm chamber and moves the actuator stem (A7) downward opposing the spring force.

3.3 Fail-safe action
When the signal pressure is reduced or the control signal fails, the fail-safe action of the actuator depends on whether the springs are installed in the top or bottom diaphragm chamber.

3.3.1 Version with fail-safe action "actuator stem extends" (FA)
When the signal pressure is reduced or the control signal fails, the springs move the actuator stem downward and close the globe valve. The valve opens when the signal pressure is increased enough to overcome the spring force.

3.3.2 Version with fail-safe action "actuator stem retracts" (FE)
When the signal pressure is reduced or the control signal fails, the springs move the actuator stem upward and open a mounted globe valve. The valve closes when the signal pressure is increased enough to overcome the spring force.

3.4 Technical data
The nameplate provide information on the actuator version (see section 2.1).

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More information is available in Data Sheet T 8820.

Supply pressure
The maximum permissible supply pressure is 90 psi (6 bar) in throttling service. See section 6.2 for restrictions in on/off service.
Temperature range

The permissible temperature range depends on the diaphragm material:

<table>
<thead>
<tr>
<th>Diaphragm material</th>
<th>Temperature range</th>
</tr>
</thead>
</table>
| NBR 1)              | -31 to +194 °F  
                     | -35 to +90 °C       |
| EPDM 2)             | -58...+248 °F  
                     | -50...+120 °C       |
| PVMQ 3)             | -76 to +194 °F  
                     | -60 to +90 °C       |

1) In on/off service, lowest temperature restricted to -4 °F (-20 °C).
2) In on/off service, lowest temperature restricted to -40 °F (-40 °C).
3) Not available for actuators with 54 in² actuator area

Accessories

The pneumatic actuators with 116 in² actuator area have a female thread on the top diaphragm case to allow an eyebolt or swivel lifting hook to be screwed into it. The eyebolt can be used to vertically lift the actuator and is included in the scope of delivery. The swivel lifting hook is designed for setting a control valve assembly upright or for lifting the actuator without valve. The swivel lifting hook can be ordered (accessories).

<table>
<thead>
<tr>
<th>Actuator area</th>
<th>Item no.</th>
<th></th>
</tr>
</thead>
<tbody>
<tr>
<td>Eyebolt</td>
<td>Swivel lifting</td>
<td></td>
</tr>
<tr>
<td>(DIN 580)</td>
<td>hook</td>
<td></td>
</tr>
<tr>
<td>116 in²</td>
<td>8325-0131</td>
<td>8442-1017</td>
</tr>
</tbody>
</table>

See section 4.2.2 for detailed information on how to lift the actuator.
## Design and principle of operation

### Table 1: Dimensions and weights

<table>
<thead>
<tr>
<th>Effective area</th>
<th>in²</th>
<th>27</th>
<th>54</th>
<th>116</th>
</tr>
</thead>
<tbody>
<tr>
<td>cm²</td>
<td></td>
<td>175</td>
<td>350</td>
<td>750</td>
</tr>
<tr>
<td>H</td>
<td>in</td>
<td>3.07</td>
<td>3.23</td>
<td>6.73</td>
</tr>
<tr>
<td></td>
<td>mm</td>
<td>78</td>
<td>82</td>
<td>171</td>
</tr>
<tr>
<td>H6 1)</td>
<td>in</td>
<td>1.06</td>
<td>1.06</td>
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<tr>
<td></td>
<td>mm</td>
<td>27</td>
<td>27</td>
<td>27</td>
</tr>
<tr>
<td>H7 2)</td>
<td>in</td>
<td>-</td>
<td>-</td>
<td>2.56</td>
</tr>
<tr>
<td></td>
<td>mm</td>
<td>-</td>
<td>-</td>
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<tr>
<td>Diameter ØD</td>
<td>in</td>
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<td>11.02</td>
<td>15.5</td>
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<tr>
<td></td>
<td>mm</td>
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<td>280</td>
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<tr>
<td>Diameter ØD2</td>
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<tr>
<td></td>
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<td>16</td>
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<tr>
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<td></td>
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<td></td>
</tr>
<tr>
<td>Connection</td>
<td>a</td>
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<td>¾ NPT</td>
<td>¾ NPT</td>
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<tr>
<td>Weight</td>
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<td>18</td>
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</tr>
<tr>
<td></td>
<td>kg</td>
<td>6</td>
<td>8</td>
<td>36</td>
</tr>
</tbody>
</table>

1) For Type 3525 Compact: 0.67 in (17 mm)
2) Actuators 27 and 54 in² without lifting eyelet
Design and principle of operation

Dimensional drawings

Type 3571 Pneumatic Actuator

Diagram showing dimensions: ØD, H, H6, Ød, ØD2.
4 Preparation

After receiving the shipment, proceed as follows:

1. Check the scope of delivery. Compare the shipment received against the delivery note.
2. Check the shipment for transportation damage. Report any damage to SAMSON and the forwarding agent (refer to delivery note).

4.1 Unpacking

**Note**

Do not remove the packaging until immediately before mounting.

Proceed as follows to lift and mount the actuator:

1. Remove the packaging from the actuator.
2. Dispose of the packaging in accordance with the valid regulations.

4.2 Transporting and lifting

**DANGER**

Hazard due to suspended loads falling. Stay clear of suspended or moving loads.

**WARNING**

Risk of lifting equipment tipping and risk of damage to lifting accessories due to exceeding the rated lifting capacity.

- Only use approved lifting equipment and accessories whose minimum lifting capacity is higher than the weight of the actuator.
- Refer to section 3.4 for weights.

**NOTICE**

Risk of actuator damage due to incorrectly attached slings.

- The welded-on lifting eyelet, eyebolt or swivel lifting hook on the top diaphragm case (116 in²) is intended for mounting and removing the actuator as well as lifting the actuator without valve. Do not lift the entire control valve assembly using the lifting eyelet, eyebolt or swivel lifting hook.
- Observe lifting instructions (see section 4.2.2).

**Tip**

SAMSON’s After-sales Service department can provide more detailed transport and lifting instructions on request.
4.2.1 Transporting

The actuator can be transported using lifting equipment (e.g. crane or forklift).

- Leave the actuator in its transport container or on the pallet to transport it.
- Observe the transport instructions.

**Transport instructions**

- Protect the actuator against external influences (e.g. impact).
- Do not damage the corrosion protection (paint, surface coatings). Remove any damage immediately.
- Protect the actuator against moisture and dirt.
- The permissible transportation temperature is –4 to +149 °F (–20 to +65 °C).

4.2.2 Lifting

To mount a large actuator, use lifting equipment (e.g. crane or forklift) to lift it.

**Lifting instructions**

- Secure slings against slipping.
- Make sure the slings can be removed from the actuator once it has been mounted onto the valve.
- Prevent the actuator from tilting or tipping.
- Do not leave loads suspended when interrupting work for longer periods of time.
- Make sure that the additional sling between the lifting eyelet, eyebolt or swivel lifting hook and the rigging equipment (hook, shackle etc.) does not bear any load when lifting control valves with the actuator already mounted. The sling only protects the control valve from tilting while being lifted. Before lifting the control valve, tighten the sling. The slings attached to the valve body must bear the entire load (see Fig. 4).

**Lifting a 27 or 54 in² actuator (without valve)**

Due to the low weight of the actuators, lifting equipment is not required to lift the actuator (e.g. to mount it onto a valve).

**Lifting a 116 in² actuator (without valve)**

1. Attach a sling to the lifting eyelet, eyebolt or swivel lifting hook of the actuator and to the rigging equipment (e.g. hook) of the crane or forklift (see Fig. 3).
2. Carefully lift the actuator. Check whether the lifting equipment and accessories can bear the weight.
3. Move the actuator at an even pace to the mounting site.
4. Mount the actuator to the valve. See section 5.1.
5. Remove slings after mounting.

**Tip**

We recommend using a hook with safety latch (see Fig. 3). The safety latch prevents the slings from slipping during lifting and transporting.
Preparation

Lifting the entire control valve assembly
⇒ See associated valve documentation for instructions on how to lift a control valve.

4.3 Storage

⚠️ NOTICE
Risk of actuator damage due to improper storage.
- Observe storage instructions.
- Avoid long storage times.
- Contact SAMSON in case of different storage conditions or longer storage times.

We recommend regularly checking the actuator and the prevailing storage conditions during long storage times.

Storage instructions
- When the valve and actuator are already assembled, observe the storage conditions for control valves. See associated valve documentation.
- Protect the actuator against external influences (e.g. impact).

![Fig. 3: Lifting point on the actuator (116 in²)](image)

![Fig. 4: Lifting points on the control valve (example)](image)
- Do not damage the corrosion protection (paint, surface coatings). Remove any damage immediately.
- Protect the actuator against moisture and dirt. Store it at a relative humidity of less than 75%. In damp spaces, prevent condensation. If necessary, use a drying agent or heating.
- Make sure that the ambient air is free of acids or other corrosive media.
- The permissible storage temperature is -4 to +149 °F (-20 to +65 °C).
- Do not place any objects on the actuator.

**Special storage instructions for soft parts**
Soft parts, e.g. actuator diaphragm
- To keep soft parts in shape and to prevent cracking, do not bend them or hang them up.
- We recommend a storage temperature of 59 °F (15 °C) for soft parts.
- Store soft parts away from lubricants, chemicals, solutions and fuels.

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**Tip**
SAMSON’s After-sales Service department can provide more detailed storage instructions on request.

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### 4.4 Preparation for installation

Proceed as follows:
- Check the actuator for damage.
- Check to make sure that the type designation, material and temperature range of the actuator match the plant conditions.
- Check the pressure gauge installed on valve accessories to make sure it functions.
- When the valve and actuator are already assembled, check the tightening torques of the bolted joints (➤ AB 0100). Components may loosen during transport.
5 Mounting and start-up

SAMSON control valves are delivered ready for use. In special cases, the valve and actuator are delivered separately and must be assembled on site. The procedures to mount and start up the actuator are described in following.

**NOTICE**

Risk of actuator damage due to excessively high or low tightening torques.
Observe the specified torques on tightening actuator components. Excessively tightened torques lead to parts wearing out quicker. Parts that are not tightened far enough may loosen.
Observe the specified tightening torques (*AB 0100*).

**NOTICE**

Risk of actuator damage due to the use of unsuitable tools.
Only use tools approved by SAMSON (*AB 0100*).

**Note**

See associated valve documentation for additional mounting instructions.

5.1 Mounting the actuator onto the valve

Proceed as follows if the valve and actuator have not been assembled by SAMSON:

- Remove the mounted actuator before mounting the other actuator (see section 9.2).
- Preloading the actuator springs increases the thrust and reduces the travel range of the actuator (see section 5.2).

**Tip**

The valve and actuator are assembled with special attention paid to the actuator’s signal pressure range and direction of action. These details are specified on the actuator name-plate (see section 2.1).

1. Remove the clamps of the stem connector (A28) and the ring nut (A8) from the actuator.
2. Slide the ring nut over the plug stem (36).
3. **Type 3525 standard valve**: Place the actuator onto the bonnet (2) and secure it with the ring nut (A8).
   
   **Type 3525 compact valve**: Place the actuator onto the yoke (3) and secure it with the ring nut (A8).
   
   Observe tightening torques.
4. Determine the lower and upper signal pressure range values:
Mounting and start-up

Fig. 6: Type 3571 Pneumatic Actuator on Type 3525 valve
The lower signal pressure range value is the same as the minimum value of the bench range or operating range (with preloaded springs).

The upper signal pressure range value is the same as the maximum value of the bench range or operating range (with preloaded springs).

For actuator springs that are to be preloaded subsequently, determine the upper and lower signal pressure range as described in section 5.2.

5. Depending on the direction of action:
   - **Stem extends**: Connect the signal pressure with the bottom loading pressure connection (S) that leads to the bottom diaphragm chamber.
   - **Stem retracts**: Connect the signal pressure with the top loading pressure connection (S) that leads to the top diaphragm chamber.

6. **Stem extends**: Apply signal according to upper signal range value (see T 8820) to move actuator to its top-most position.
   - **Stem retracts**: Shut off any signal applied to the actuator to move actuator to its top-most position.

7. Press the plug together with the plug stem firmly into the seat ring.

8. Place one half of the stem connector clamp (A28) against the head of the plug stem (36) so that the nut's recessed part fits onto the plug head.

9. Align the zero position (bottom line) of the travel indicator scale (84) with the groove in the stem connector clamp (A28), see Fig. 7.

10. Lift up the plug stem (36). Use the connector nut (A28) to connect the plug stem

---

**Fig. 7:** Minimum travel position
(36) with the actuator stem (A7). Make sure that the groove in the connector nut (A28) is aligned to the desired maximum travel position, see Fig. 5.

**Note**
The desired travel position must not be below 1/3 of the full travel, see Fig. 5.

Fig. 5: Maximum travel position

11. Move actuator to open position. Make sure that the connector nut (A28) does not touch the bonnet.

12. Tighten the stem connector screws (A29) using a suitable tool. Observe tightening torques.

13. Move actuator to closed position. Make sure that the connector nut (A28) does not touch the bonnet.

### 5.2 Reducing the actuator travel

Reducing the actuator travel has effects that differ depending on the direction of action.

#### 5.2.1 Direction of action: stem extends

Reducing the actuator travel leads to a higher spring force due to preloaded springs. The springs of the actuator can be preloaded by up to 2/3 of their travel or signal pressure range. The spring force is equivalent to the actuator thrust when no supply pressure is applied.

**Note**
Actuators that have already been preloaded by SAMSON without mounting the valve are labeled correspondingly. Additionally, preloaded actuators can be identified by the long bolts protruding from the bottom of the actuator. They allow the spring compression to be relieved evenly when disassembling the actuator (see section 9.2).

**Example**
27 in² actuator with 2/3 (0.66) inch travel
- fail-safe action: valve closed
- signal pressure range: 20 to 35 psi
- actuator thrust: 540 lbf (2400 N)

Applying the upper signal range value of 35 psi completely opens the valve. When reducing the travel by lowering the stem connector clamp (~4.5 turns), the valve closes.
Mounting and start-up

In this example, the travel (0.66 inch) is reduced by $\frac{1}{3}$ to 0.44 inch.

$\frac{1}{3}$ of the signal pressure range is:

$\frac{1}{3} \cdot (35 - 20 \text{ psi}) = 5 \text{ psi}$

The new lower signal pressure range value is 25 psi.

The increased actuator thrust is

$25 \text{ psi} \cdot 27 \text{ in}^2 = 675 \text{ lbf (3000 N)}$

⇒ Write the new signal pressure range of 25 to 35 psi on the actuator nameplate as the operating range with preloaded springs.

5.2.2 Direction of action: stem retracts

When reducing the actuator travel for direction of action “stem retracts”, only the lower portion of the actuator’s signal pressure range can be used. The range is reduced by the same figure as the travel. For example, when reducing the travel by $\frac{1}{3}$, the signal pressure range, too, is reduced by $\frac{1}{3}$.

Reducing the actuator travel leads to a higher force on the plug. The spring force is reduced, while the actuator thrust is increased.

Example

54 in$^2$ actuator with $\frac{1}{3}$ (0.66) inch travel

- fail-safe action: valve open
- signal pressure range: 9 to 16.5 psi
- spring force at closing point: 891 lbf (3963 N)
- actuator thrust at 50 psi supply pressure: 1809 lbf (8046 N)

Without supply pressure, the valve is completely open.
5.3 Additional fittings

Vent plug
Vent plugs are screwed into the exhaust air ports of pneumatic and electropneumatic devices. They ensure that any exhaust air that forms can be vented to the atmosphere (to avoid excess pressure in the device). Furthermore, the vent plugs allow air intake to prevent a vacuum from forming in the device.

→ Position the vent plug on the opposite side of the workplace of operating personnel.

→ On mounting valve accessories, make sure that they can be operated from the workplace of the operating personnel.

Note
The workplace of operating personnel is the location from which the valve, actuator and any mounted valve accessories can be accessed to operate them.
6 Operation

**WARNING**
Crush hazard arising from moving parts (actuator stem).
Do not insert hands or fingers into the yoke while the valve is in operation.

**WARNING**
Risk of personal injury when actuator vents. Wear eye protection when working in close proximity to the control valve.

**NOTICE**
Operating disturbed by a blocked actuator and plug stem.
Do not impede the movement of the actuator or plug stem by inserting objects into their path.

6.1 Throttling service
The Type 3571 Pneumatic Actuator with 27, 54 and 116 in² actuator areas is designed for a maximum supply pressure of 90 psi (6 bar) when used for throttling service.

6.2 On/off service
In on/off service, the supply pressure must be limited depending on the bench range or signal pressure range of the actuator. The applicable bench range or signal pressure range which the actuator can move through is written on the nameplate (see section 3.4).

### Actuator stem retracts (FE)
For the direction of action “actuator stem retracts (FE)”, the permissible supply pressure must not exceed the upper bench range value by more than 45 psi (3 bar):

<table>
<thead>
<tr>
<th>Bench range</th>
<th>Fail-safe action</th>
<th>Max. supply pressure</th>
</tr>
</thead>
<tbody>
<tr>
<td>3 to 15 psi</td>
<td>Actuator stem retracts</td>
<td>60 psi (4 bar)</td>
</tr>
<tr>
<td>(0.2 to 1.0 bar)</td>
<td></td>
<td></td>
</tr>
<tr>
<td>3 to 30 psi</td>
<td></td>
<td>75 psi (5 bar)</td>
</tr>
<tr>
<td>(0.4 to 2.0 bar)</td>
<td></td>
<td></td>
</tr>
<tr>
<td>9 to 45 psi</td>
<td></td>
<td>90 psi (6 bar)</td>
</tr>
<tr>
<td>(0.6 to 3.0 bar)</td>
<td></td>
<td></td>
</tr>
</tbody>
</table>

### Actuator stem extends (FA)
With fail-safe action “actuator stem extends” and travel stop, the supply pressure must not exceed the upper spring range value by more than 22.5 psi (1.5 bar).

**Additional points that apply concerning operation:**
- Label actuators with reduced supply pressure with a sticker (“Max. supply pressure limited to ... psi”).
- Only apply the signal pressure to the loading pressure connection (S) on the diaphragm chamber of the actuator which does not contain any springs (see Fig. 2).
- Only use vent plugs that let air through them (16 in Fig. 2).
6.3 Reversal of the direction of action

The operating direction and fail-safe action of actuators can be changed. The fail-safe action is indicated on the nameplate by a symbol:

- Actuator stem extends (FA)
- Actuator stem retracts (FE)

**DANGER**
Risk of bursting in the actuator. Actuators are pressurized. Improper opening can lead to actuator components bursting. Before starting any work on the actuator, depressurize all plant sections concerned and the actuator.

**WARNING**
Risk of personal injury due to preloaded springs! Actuators with preloaded springs are under tension. They can be identified by the long bolts protruding from the bottom of the actuator. Before starting any work on the actuator, relieve the compression from the preloaded springs (see section 9.3).

**NOTICE**
Risk of malfunction due to incorrect details on the nameplate after the reversal of the direction of action. After reversal, the symbol and configuration ID on the nameplate are no longer valid. Contact SAMSON to request a new nameplate.

**Note**
To reverse the direction of action, remove a mounted actuator from the valve. If the actuator is not yet mounted onto the valve, remove the stem connector clamp (A28).
6.3.1 Reversing from stem extends to stem retracts

1. Relieve the spring compression of actuators with preloaded springs (see section 9.3).

2. Lift off the top diaphragm case (A1) and remove springs (A10).

3. Pull the actuator stem (A7) together with the diaphragm plate (A5) and diaphragm (A4) out of the bottom diaphragm case (A2).

   **Actuator area 54 in²:** Make sure to not loosen the adjustable clamp (A6) at the diaphragm (A4).

4. Clamp the actuator stem (A7) into a vice using protective jaws. Make sure that the actuator stem is not damaged.

5. **Actuator area 27 in²:** Unscrew the nut (A33) while holding the nut (A9) with a suitable tool.

   **Actuator area 54 in²:** Unscrew the collar nut (A15).

   **Actuator area 116 in²:** Unscrew the nut (A33) while holding the slotted nut (A34) with a suitable tool.

6. **Actuator area 27 and 116 in²:** Take the distance piece (A36), diaphragm plate (A5), compressor (A35) and diaphragm (A4) off the actuator stem (A7).

   **Actuator area 54 in²:** Take the distance piece (A36), diaphragm plate (A5) and diaphragm (A4) off the actuator stem (A7).

7. **Actuator area 27 and 116 in²:** Place all parts in reverse order onto the actuator.

---

**Fig. 8:** Type 3571 Pneumatic Actuator with actuator area 54 in²
stem (A7), see Fig. 9. Make sure that the seal lip of the diaphragm (A4) is inserted correctly between compressor (A35) and diaphragm plate (A5). Place a new O-ring (A17) between distance piece (A36) and diaphragm plate (A5).

**Actuator area 54 in²**: Place all parts in reverse order onto the actuator stem (A7), see Fig. 9.

8. **Actuator area 27 in²**: Screw the nut (A33) against the distance piece (A36) while holding the nut (A9) with a suitable tool.

**Actuator area 54 in²**: Tighten the collar nut (A15).

**Actuator area 116 in²**: Screw the nut (A33) against the distance piece (A36) while holding the slotted nut (A34) with a suitable tool.

9. Apply suitable sealant and lubricant to the actuator stem (A7).

10. Place the springs (A10) in the bottom diaphragm case (A2), centering them in the intended recesses.

11. Insert the actuator stem (A7) together with the diaphragm plate (A5) and diaphragm (A4) into the bottom diaphragm case (A2).

12. Place on the top diaphragm case (A1).

13. Fasten the top and bottom diaphragm case (A1, A2) with the nuts (A21) and bolts (A20). Observe tightening torques.

14. Remove vent plug (A16) from the top signal pressure connection and screw it into the bottom connection (S).

---

**Fig. 9**: Arrangement of parts for "stem retracts" direction of action
Operation

The actuator springs, which now push against the diaphragm plate from below, cause the actuator stem to retract. The signal pressure is connected to the connection (S) on the top diaphragm case. As a result, the actuator stem extends opposing the spring force as the signal pressure increases.

15. Affix a new nameplate with changed symbol and new configuration ID to the actuator.

6.3.2 Reversing from stem retracts to stem extends

1. Undo the nuts (A21) and bolts (A20) on the diaphragm case.

2. Lift off the top diaphragm case (A1).

3. Pull the actuator stem (A7) together with the diaphragm plate (A5) and diaphragm (A4) out of the bottom diaphragm case (A2).

4. Remove the springs (A10).

5. Clamp the actuator stem (A7) into a vice using protective jaws. Make sure that the actuator stem is not damaged.

6. **Actuator area 27 in²**: Unscrew the nut (A33) while holding the nut (A9) with a suitable tool.

   **Actuator area 54 in²**: Unscrew the collar nut (A15).

   **Actuator area 116 in²**: Unscrew the nut (A33) while holding the slotted nut (A34) with a suitable tool.

7. **Actuator area 27 in²**: Take the distance piece (A36), diaphragm plate (A5), compressor (A35) and diaphragm (A4) off the actuator stem (A7).

   **Actuator area 54 in²**: Take the distance piece (A36), diaphragm plate (A5) and diaphragm (A4) with adjustable clamp (A6) off the actuator stem (A7).

   **Actuator area 116 in²**: Take the distance piece (A36), diaphragm plate (A5), compressor (A35) and diaphragm (A4) off the actuator stem (A7).

8. **Actuator area 27 and 116 in²**: Place all parts in reverse order onto the actuator stem (A7), see Fig. 10. Make sure that the seal lip of the diaphragm (A4) is inserted correctly between compressor (A35) and diaphragm plate (A5). Place a new O-ring (A17) between distance piece (A36) and diaphragm plate (A5).

9. **Actuator area 27 in²**: Screw the nut (A33) against the distance piece (A36) while holding the nut (A9) with a suitable tool.

   **Actuator area 54 in²**: Tighten the collar nut (A15).

   **Actuator area 116 in²**: Screw the nut (A33) against the distance piece (A36) while holding the slotted nut (A34) with a suitable tool.

   Observe tightening torques.

10. Apply suitable sealant and lubricant to the actuator stem (A7).
11. Insert the actuator stem (A7) together with the diaphragm plate (A5) and diaphragm (A4) into the bottom diaphragm case (A2).

12. Place the springs (A10) in the bottom diaphragm case (A2), centering them in the intended recesses.

13. Place on the top diaphragm case (A1).

14. Fasten the top and bottom diaphragm case (A1, A2) with the nuts (A21) and bolts (A20). Observe tightening torques.

15. Remove the vent plug (A16) from the bottom signal pressure connection and screw it into the top connection (S).

The actuator springs, which now push against the diaphragm plate from above, cause the actuator stem to extend. The signal pressure is connected to the connection (S) on the bottom diaphragm case. As a result, the actuator stem retracts opposing the spring force as the signal pressure increases.

16. Preload springs, if required (see section 5.2).

17. Affix a new nameplate with changed symbol and new configuration ID to the actuator.
7 Maintenance

⚠️ DANGER
Risk of bursting in the actuator.
Actuators are pressurized. Improper opening can lead to actuator components bursting.
Before starting any work on the actuator, depressurize all plant sections concerned and the actuator.

⚠️ WARNING
Risk of personal injury due to preloaded springs!
Actuators with preloaded springs are under tension. They can be identified by the long bolts protruding from the bottom of the actuator.
Before starting any work on the actuator, relieve the compression from the preloaded springs (see section 9.3).

⚠️ NOTICE
Risk of valve damage due to incorrect maintenance or repair.
Service and repair work must only be performed by trained staff.

⚠️ NOTICE
Risk of valve damage due to excessively high or low tightening torques.
Observe the specified torques on tightening actuator components. Excessively tightened torques lead to parts wearing out quicker.

Parts that are not tightened far enough may loosen.
Observe the specified tightening torques (AB 0100).

⚠️ NOTICE
Risk of valve damage due to the use of unsuitable tools.
Only use tools approved by SAMSON (AB 0100).

⚠️ NOTICE
Risk of valve damage due to the use of unsuitable lubricants.
Only use lubricants approved by SAMSON (AB 0100).

⚠️ Note
The actuator was checked by SAMSON before it left the factory.
– The product warranty becomes void if maintenance or repair work not described in these instructions is performed without prior agreement by SAMSON's After-sales Service department.
– Only use original spare parts by SAMSON, which comply with the original specifications.
7.1 Replacing the diaphragm

Version with fail-safe action “actuator stem extends”

1. Remove the actuator from the valve (see section 9.2).
2. Relieve the spring compression of actuators with preloaded springs (see section 9.3).
3. Lift off the top diaphragm case (A1) and remove springs (A10).
4. Pull the actuator stem (A7) together with the diaphragm plate (A5) and diaphragm (A4) out of the bottom diaphragm case (A2).
5. Clamp the actuator stem (A7) into a vice using protective jaws. Make sure that the actuator stem is not damaged.
6. **Actuator area 27 in²**: Unscrew the nut (A33) while holding the nut (A9) with a suitable tool.
7. **Actuator area 54 in²**: Unscrew the collar nut (A15).
8. **Actuator area 116 in²**: Unscrew the nut (A33) while holding the slotted nut (A34) with a suitable tool.
9. **Actuator areas 27 and 116 in²**: Take the diaphragm plate (A5) and diaphragm (A4) from the actuator stem (A7).
10. **Actuator area 54 in²**: Open the adjustable clamp (A6) and dispose of it.

**Fig. 11: Type 3571 Pneumatic Actuator with actuator area 54 in²**
**Maintenance**

**Stem retracts**

27 and 116 in²

54 in²

| A4 | Diaphragm |
| A5 | Diaphragm plate |
| A6 | Adjustable clamp |
| A7 | Actuator stem |
| A9 | Nut (glued to A7) |

1) only for 27 in²  
2) only for 116 in²

**Compressor**

**Collar nut**

**O-ring**

**Nut**

**Slotted nut**

**Stem extends**

27 and 116 in²

54 in²

**Fig. 12: Arrangement of parts for Type 3571 Pneumatic Actuator**
8. **Actuator area 27 and 116 in²**: Place the new diaphragm in the diaphragm plate (A5) and put them on the actuator stem (A7). Make sure that the seal lip of the diaphragm (A4) is inserted correctly between compressor (A35) and diaphragm plate (A5). Place a new O-ring (A17) between distance piece (A36) and diaphragm plate (A5).

   **Actuator area 54 in²**: Place a new adjustable clamp (A6) on the new diaphragm (A4). Tighten the clamp until there is only a gap of some millimeters between diaphragm and clamp.

   Place the compressor (A19) under the clamp (A6) and tighten it by hand. Observe tightening torques.

   Put the assembled construction on the actuator stem (A7).

9. **Actuator area 27 in²**: Screw the nut (A33) against the distance piece (A36) while holding the nut (A9) with a suitable tool.

   **Actuator area 54 in²**: Tighten the collar nut (A15).

   **Actuator area 116 in²**: Screw the nut (A33) against the distance piece (A36) while holding the slotted nut (A34) with a suitable tool.

   Observe tightening torques.

10. **Actuator area 27 in²**: Unscrew the nut (A33) while holding the nut (A9) with a suitable tool.

   **Actuator area 54 in²**: Unscrew the collar nut (A15).

   **Actuator area 116 in²**: Unscrew the nut (A33) while holding the slotted nut (A34) with a suitable tool.

12. Place the springs (A10) in the bottom diaphragm case, centering them in the intended recesses.

13. Place on the top diaphragm case (A1).

14. Fasten the top and bottom diaphragm cases (A1, A2) together with the nuts (A21) and bolts (A20). Observe tightening torques.

15. If necessary, preload the springs (see section 5.2).

16. Mount the actuator on the valve (see section 5.1).

**Version with fail-safe action “actuator stem retracts”**

1. Remove the actuator from the valve (see section 9.2).

2. Undo the nuts (A21) and bolts (A20) on the diaphragm case.

3. Lift off the top diaphragm case (A1).

4. Pull the actuator stem (A7) together with the diaphragm plate (A5) and diaphragm (A4) out of the bottom diaphragm case (A2).

5. Clamp the actuator stem (A7) into a vice using protective jaws. Make sure that the actuator stem is not damaged.

6. **Actuator area 27 in²**: Unscrew the nut (A33) while holding the nut (A9) with a suitable tool.

   **Actuator area 54 in²**: Unscrew the collar nut (A15).

   **Actuator area 116 in²**: Unscrew the nut (A33) while holding the slotted nut (A34) with a suitable tool.
7. **Actuator areas 27 and 116 in²**: Take the diaphragm plate (A5) and diaphragm (A4) from the actuator stem (A7).

   **Actuator area 54 in²**: Open the adjustable clamp (A6) and dispose of it.

8. **Actuator area 27 and 116 in²**: Place the new diaphragm in the diaphragm plate (A5) and put them on the actuator stem (A7). Make sure that the seal lip of the diaphragm (A4) is inserted correctly between compressor (A35) and diaphragm plate (A5). Place a new O-ring (A17) between distance piece (A36) and diaphragm plate (A5).

   **Actuator area 54 in²**: Place a new adjustable clamp (A6) on the new diaphragm (A4). Tighten the clamp until there is only a gap of some millimeters between diaphragm and clamp.

   Place the compressor (A19) under the clamp (A6) and tighten it by hand. Observe tightening torques.

   Put the assembled construction on the actuator stem (A7).

9. **Actuator area 27 in²**: Screw the nut (A33) against the distance piece (A36) while holding the nut (A9) with a suitable tool.

   **Actuator area 54 in²**: Tighten the collar nut (A15).

   **Actuator area 116 in²**: Screw the nut (A33) against the distance piece (A36) while holding the slotted nut (A34) with a suitable tool.

   Observe tightening torques.

10. Apply suitable sealant and lubricant to the actuator stem (A7).

11. Insert the actuator stem (A7) together with the diaphragm plate (A5) and diaphragm (A4) into the bottom diaphragm case (A2).

12. Place the springs (A10) in the bottom diaphragm case, centering them in the intended recesses.

13. Place on the top diaphragm case (A1).

14. Fasten the top and bottom diaphragm cases (A1, A2) together with the nuts (A21) and bolts (A20). Observe tightening torques.

15. Mount the actuator on the valve (see section 5.1).

### 7.2 Replacing the actuator stem seals

**Version with fail-safe action “actuator stem extends”**

1. Remove the actuator from the valve (see section 9.2).

2. Relieve the spring compression of actuators with preloaded springs (see section 9.3).

3. Lift off the top diaphragm case (A1) and remove springs (A10).

4. Pull the actuator stem (A7) together with the diaphragm plate (A5) and diaphragm (A4) out of the bottom diaphragm case (A2).

5. Remove the radial shaft seal (A40) using a suitable tool.
6. Apply a suitable sealant and lubricant to the new radial shaft seal.
7. Use a suitable mandrel to mount the radial shaft seal.
8. Renew the dry bearing (A42) and wiper (A41), if necessary.
9. Apply suitable sealant and lubricant to the actuator stem (A7).
10. Insert the actuator stem (A7) together with the diaphragm plate (A5) and diaphragm (A4) into the bottom diaphragm case (A2).
11. Place the springs (A10) in the bottom diaphragm case, centering them in the intended recesses.
12. Place on the top diaphragm case (A1).
13. Fasten the top and bottom diaphragm cases (A1, A2) together with the nuts (A21) and bolts (A20). Observe tightening torques.
14. If necessary, preload the springs (see section 5.2).
15. Mount the actuator on the valve (see section 5.1).

**Version with fail-safe action “actuator stem retracts”**

1. Remove the actuator from the valve (see section 9.2).
2. Undo the nuts (A21) and bolts (A20) on the diaphragm case.
3. Lift off the top diaphragm case (A1).
4. Pull the actuator stem (A7) together with the diaphragm plate (A5) and diaphragm (A4) out of the bottom diaphragm case (A2).
5. Remove the radial shaft seal (A40) using a suitable tool.
6. Apply a suitable sealant and lubricant to the new radial shaft seal.
7. Use a suitable mandrel to mount the radial shaft seal.
8. Renew the dry bearing (A42) and wiper (A41), if necessary.
9. Apply suitable sealant and lubricant to the actuator stem (A7).

![Fig. 13: Actuator stem seals](image-url)
10. Make sure that the springs (A10) are still centered in the intended recesses of the bottom diaphragm case.

11. Insert the actuator stem (A7) together with the diaphragm plate (A5) and diaphragm (A4) into the bottom diaphragm case (A2).

12. Place on the top diaphragm case (A1).

13. Fasten the top and bottom diaphragm cases (A1, A2) together with the nuts (A21) and bolts (A20). Observe tightening torques.

14. Mount the actuator on the valve (see section 5.1).

7.4 Ordering spare parts and operating supplies

Contact your nearest SAMSON subsidiary or the SAMSON After-sales Service department for information on spare parts, lubricants and tools.

Spare Parts
See section 10.2 for details on spare parts.

Lubricants
Details on suitable lubricants can be found in the document ▶ AB 0100.

Tools
Details on suitable tools can be found in the document ▶ AB 0100.

7.3 Preparation for return shipment

Defective actuators can be returned to SAMSON for repair.

Proceed as follows to return valves to SAMSON:

1. Put the control valve out of operation.
   See associated valve documentation.

2. Remove the actuator from the valve (see section 9.2).

3. Send the actuator to your nearest SAMSON subsidiary. SAMSON subsidiaries are listed on our website at ▶ www.samsoncontrols.com > Contact.
## 8 Malfunctions

Depending on the operating conditions, check the actuator at certain intervals to prevent possible failure before it can occur. Operators are responsible for drawing up a test plan.

### Troubleshooting

<table>
<thead>
<tr>
<th>Malfunction</th>
<th>Possible reasons</th>
<th>Recommended action</th>
</tr>
</thead>
<tbody>
<tr>
<td>Actuator stem does not move on demand.</td>
<td>Actuator is blocked.</td>
<td>Check attachment. Unblock the actuator.</td>
</tr>
<tr>
<td></td>
<td>Insufficient signal pressure.</td>
<td>Check the signal pressure.</td>
</tr>
<tr>
<td></td>
<td></td>
<td>Check the signal pressure line for leakage.</td>
</tr>
<tr>
<td></td>
<td>Signal pressure not connected to the correct diaphragm chamber.</td>
<td>See section 3.2.</td>
</tr>
<tr>
<td>Actuator stem does not stroke through its complete travel range.</td>
<td>Insufficient signal pressure.</td>
<td>Check the signal pressure.</td>
</tr>
<tr>
<td></td>
<td></td>
<td>Check the signal pressure line for leakage.</td>
</tr>
<tr>
<td></td>
<td>Valve accessories incorrectly set.</td>
<td>Check the actuator without valve accessories.</td>
</tr>
<tr>
<td></td>
<td></td>
<td>Check the settings of the valve accessories.</td>
</tr>
</tbody>
</table>

### Note

Contact SAMSON's After-sales Service department for malfunctions not listed in the table.
9 Decommissioning and disassembly

**DANGER**
Risk of bursting in the actuator.
Actuators are pressurized. Improper opening can lead to actuator components bursting.
Before starting any work on the actuator, depressurize all plant sections concerned and the actuator.

**WARNING**
Risk of personal injury due to preloaded springs!
Actuators with preloaded springs are under tension. They can be identified by the long bolts protruding from the bottom of the actuator.
Before starting any work on the actuator, relieve the compression from the preloaded springs (see section 9.3).

9.1 Decommissioning

To decommission the actuator for service and repair work or disassembly, proceed as follows:

1. Put the control valve out of operation.
   See associated valve documentation.
2. Disconnect the pneumatic air supply to depressurize the actuator.

9.2 Removing the actuator from the valve

1. Put the control valve out of operation.
   See associated valve documentation.
2. Undo the screws (A29) of the stem connector clamp (A28) and take stem connector clamp off the actuator stem.
3. Separate the actuator from the valve by undoing the ring nut (A8).
4. Place the stem connector clamp (A28) at the actuator stem (A7) and fasten it loosely with the screws (A29).

9.3 Relieving the compression of the springs in the actuator

1. Undo the short nuts (A21) and bolts (A20) on the diaphragm cases.
2. Undo the long nuts (A23) and bolts (A22) on the diaphragm cases evenly in a crisscross pattern.

9.4 Disposal

- Observe local, national and international refuse regulations.
- Do not dispose of components, lubricants and hazard substances together with your other household waste.
10 Appendix

10.1 Customer inquiries

Contact SAMSON’s After-sales Service department for support concerning maintenance or repair work or when malfunctions or defects arise.

E-mail

You can reach the After-sales Service department at samson@samsongroupna.com.

Addresses of SAMSON AG and its subsidiaries

The addresses of SAMSON AG, its subsidiaries, representatives and service facilities worldwide can be found on the SAMSON website, in all SAMSON product catalogs or on the back of these Mounting and Operating Instructions.

Required specifications

Please submit the following details:

- Order number and position number in the order
- Type, model number, actuator area, travel and bench range (e.g. 3 to 16 psi or 0.21 to 1.10 bar) or the operating range of the actuator
- Type designation of mounted valve
- Installation drawing

10.2 Spare parts

1  Top diaphragm case
2  Bottom diaphragm case
4  Diaphragm
5  Diaphragm plate
7  Actuator stem
8  Ring nut
9  Nut (glued to actuator stem) 1)
10 Spring (external)
11 Spring (internal)
12 Spring (internal)
16 Vent plug
17 O-ring
20 Hexagon bolt
21 Hexagon nut
22 Hexagon bolt (preloading)
23 Hexagon nut (preloading)
24 Stopper
25 Washer
28 Stem connector clamp
29 Stem connector screw
33 Nut
34 Slotted nut 2)
35 Compressor
36 Distance piece
40 Radial shaft seal
41 Wiper ring
42 Dry bearing
100 Nameplate
101 Label (preloading)
140 Eyebolt 2)
300 Stopper

1) only for 27 in² actuator area
2) only for 116 in² actuator area
Actuators 27 and 116 in²
### Appendix

<table>
<thead>
<tr>
<th></th>
<th>Description</th>
</tr>
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<tbody>
<tr>
<td>1</td>
<td>Top diaphragm case</td>
</tr>
<tr>
<td>2</td>
<td>Bottom diaphragm case</td>
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<tr>
<td>4</td>
<td>Diaphragm</td>
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<tr>
<td>5</td>
<td>Diaphragm plate</td>
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<tr>
<td>6</td>
<td>Adjustable clamp (with compressor)</td>
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<tr>
<td>7</td>
<td>Actuator stem</td>
</tr>
<tr>
<td>8</td>
<td>Ring nut</td>
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<tr>
<td>9</td>
<td>Nut (glued to actuator stem)</td>
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<tr>
<td>10</td>
<td>Spring (external)</td>
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<tr>
<td>11</td>
<td>Spring (internal)</td>
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<tr>
<td>15</td>
<td>Collar nut</td>
</tr>
<tr>
<td>16</td>
<td>Vent plug</td>
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<tr>
<td>20</td>
<td>Hexagon bolt</td>
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<tr>
<td>21</td>
<td>Hexagon nut</td>
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<tr>
<td>22</td>
<td>Hexagon bolt (preloading)</td>
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<tr>
<td>23</td>
<td>Hexagon nut (preloading)</td>
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<tr>
<td>25</td>
<td>Washer</td>
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<tr>
<td>28</td>
<td>Stem connector clamp</td>
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<td>29</td>
<td>Stem connector screw</td>
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<td>36</td>
<td>Distance piece</td>
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<td>40</td>
<td>Radial shaft seal</td>
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<td>41</td>
<td>Wiper ring</td>
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<tr>
<td>42</td>
<td>Dry bearing</td>
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<tr>
<td>100</td>
<td>Nameplate</td>
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<tr>
<td>101</td>
<td>Label (preloading)</td>
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</table>